4MR | FOUR MILE RUN

RESTORATION ACTION PLAN

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ACKNOWLEDGEMENTS

CITY OF FALLS CHURCH

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EXECUTIVE SUMMARY

The restoration of Four Mile Run in the City of Falls Church will improve water quality, create new parkland, provide impetus for mixed use redevelopment along the stream, and add value to the City through higher taxes and enhanced quality of life. Near the headwaters of the stream, the Falls Church segment of Four Mile Run is impaired with E. coli and other pollutants and overgrown with invasive species, and its banks are incised and eroded. Numerous plans and studies, including the N. Washington Street Small Area Plan and Parks for People chapter of the Comprehensive Plan, have called for the stream's restoration and creation of adjacent parkland and a trail along the W. Jefferson portion of the stream.

Current land uses along Four Mile Run within the City are predominantly auto-oriented, low-density businesses with little dedicated open space. Land value is nearly four times the value of improvements in the area. A majority of the parcels along W. Jefferson Street along the stream are owned by one family, so that parcel consolidation in the area is feasible.

Improvement in the area of Four Mile Run is estimated to cost approximately $12 million: $6 million for stream restoration, $4.9 million for land acquisition, and nearly $600,000 for park development. Numerous tools are available to the City for parcel consolidation and redevelopment, including the Land Banking Fund, a public-private partnership, Tax Increment Financing, Transfer of Development Rights, Industrial Revenue Bonds, and the Arts and Culture District. Tools to assist with stream restoration include contributions from the redevelopment team, grant funding, the Northern Virginia Conservation Trust, loans, public seed money, the stormwater utility fee, and Capital Improvement Projects. Examples of stream restoration with a variety of funding sources that led to community enhancement are provided, including Carroll Creek in Frederick, MD, and Hawks Bill Greenway in Luray, VA.

The plan outlines steps the City of Falls Church should take to accomplish stream restoration in concert with redevelopment of the area.

1. **ASSESS** STREAM CONDITIONS
2. **PREPARE** PARCELS FOR REDEVELOPMENT
3. **CREATE** A VISION FOR RESTORATION & REDEVELOPMENT
4. **NEGOTIATE** PRIVATE INVESTMENT
5. **DEVELOP A PLAN** FOR RESTORATION & PARK
6. **FINANCE** IMPROVEMENTS
7. **RESTORE** FOUR MILE RUN

4MR

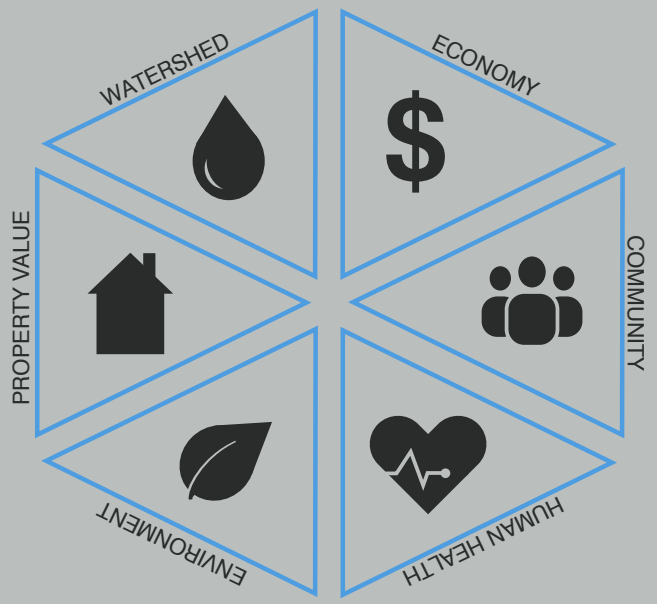
FOUR MILE RUN

GO THE EXTRA MILE

CONTEXT

VALUES OF STREAM RESTORATION

The restoration of Four Mile Run is a timely and necessary endeavor for the City of Falls Church to preserve natural ecosystems, create a vibrant, mixed-use district, strengthen the pedestrian and bicycle network, and promote a healthier lifestyle for residents. A restored stream with an expanded buffer will not only enhance quality of life, but will also improve stormwater runoff management, re-establish native plants and wildlife in and around the water, and reduce pollution. These benefits are especially important given the location of Falls Church close to the headwaters of Four Mile Run, contributing to its health downstream as well as the Potomac River and the Chesapeake Bay. In addition to environmental benefits, parks and open space add significant economic value through increased property taxes and by spurring new development. After more than 30 years of discussion and proposals from the community and City documents, it is time to take action on a sustainable plan for a re-energized stream corridor.



WATERSHED

Four Mile Run's watershed stretches across much of Northern Virginia (within Arlington County, Fairfax County, the City of Falls Church, and the City of Alexandria) before it joins the Potomac River and then the Chesapeake Bay. Four Mile Run headwaters begin just north of Falls Church. The City's section of the stream is particularly important because it is so close to the headwaters. The water quality of the headwaters affects the health of the rest of the stream and, subsequently, that of the fragile Chesapeake Bay aquatic ecosystem.

4MR IS AN ECONOMIC ASSET.

Getting the "Green" out of Green Infrastructure

Green infrastructure is loosely defined as any natural resource that helps improve the quality of living of surrounding residents.[1] Parks, rivers, open field spaces, forests, and streams are examples of green infrastructure. In addition to providing recreational opportunities and a beautiful landscape, green infrastructure can also improve the value of land around it.

Additionally, parks and green infrastructure can attract net-positive taxpayers such as retirees. This group uses fewer municipal services than it pays in taxes. One study found that that two of the top three most important factors for retirees in deciding to move to an area are scenic beauty and recreational opportunities.[2]

1. McMahon, Edward, "Green Infrastructure," Planning Commissioners Journal, Winter 2000, 4.
2. Miller, Wayne. "Retirement In-Migration Study: Attractive Features, Economic & Social Impacts." (1994).

Lincoln Creek Restoration
Milwaukee, Wisconsin

20% increase in property value, resulting in $176,430 in increased tax revenue!

Four Mile Run is a perfect example of green infrastructure within the City of Falls Church. Despite being poorly maintained and hidden from public view, the stream holds the potential to be a catalyst for revitalization of the surrounding area. Two cases demonstrate the potential yield Four Mile Run has as green infrastructure: the first exemplifying the significant increase in land value after a major stream restoration project in Milwaukee, Wisconsin, and the second demonstrating the impact on real estate value of park land, generally, in Washingotn, DC.

A 2013 University of Wisconsin study found significant fiscal value of new green infrastructure improvements to the City of Milwaukee. In particular, the Lincoln Creek restoration project provided a return on investment to the City at an estimated $176,430 in real estate taxes annually, not including the savings in flood damage.[3]

The total cost of the project was over $120 million and required an initial capital investment from the City of nearly $11 million. The authors estimated that values of single-family homes near the stream were over 20 percent higher after the stream was restored, at an average of

3. Madison, Catherine and John Kovari, "Impact of Green Infrastructure on Property Values within the Milwaukee Metropolitan Sewerage District Planning Area: Case Studies," The University of Wisconsin-Milwaukee Center for Economic Development, May 2013, 35.

about $19,200 per home. Based on the local tax rate, the authors hypothesized that the increase in annual tax revenue to the City of Milwaukee due to the creek restoration in these areas is about $176,430.

The Value of Parks on Property Values

In 2009, Peter Harnik and Ben Welle studied data of municipal park systems across the country.[4] They theorized that parks can account for anywhere between 5 and 15 percent of land value of surrounding parcels within 2,000 feet of a park boundary. By applying this assumption to proximate properties in Washington, D.C. (using the conservative 5 percent and 500-foot buffer from parkland), they estimated that the annual tax yield to Washington, D.C., at the effective residential tax rate of 0.58 percent, was just under $7 million.

4. Harnik, Peter and Ben Welle, "Measuring the Economic Value of a City Park System," The Trust for Public Land, 2009, 2.

Urban Park System
Washington, DC

$6,953,377 in increased tax revenue!

$1,198,858,025 in property value attributed to parks.

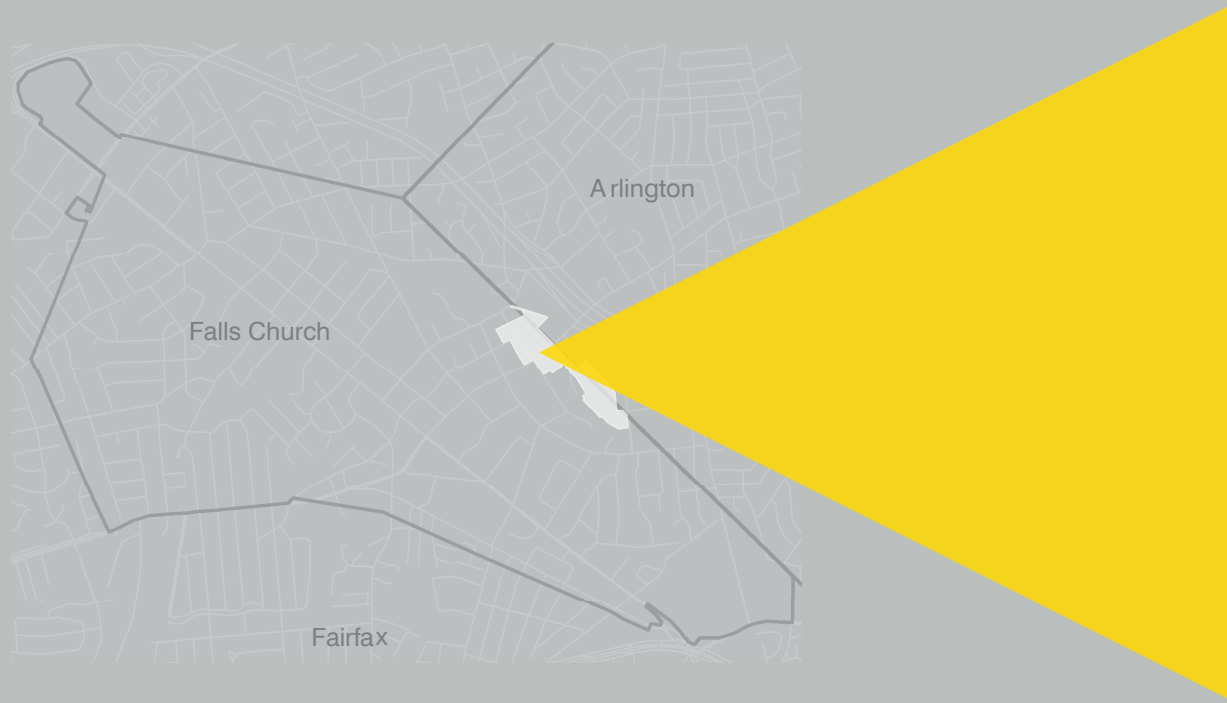
According to the Parks for People chapter of the Comprehensive Plan[5], the City hopes to acquire land for additional recreational activities and to improve pedestrian and cycling connectivity around the City. Developing parkland within the RPA in the study area will not only support these goals, it also has the potential to assist the City making a return on its investment by collecting high real estate taxes.

5. City of Falls Church, "Parks for People; Parks, Open Space, and Recreation Chapter of the City's Comprehensive Plan", City of Falls Church, February 23, 2015.

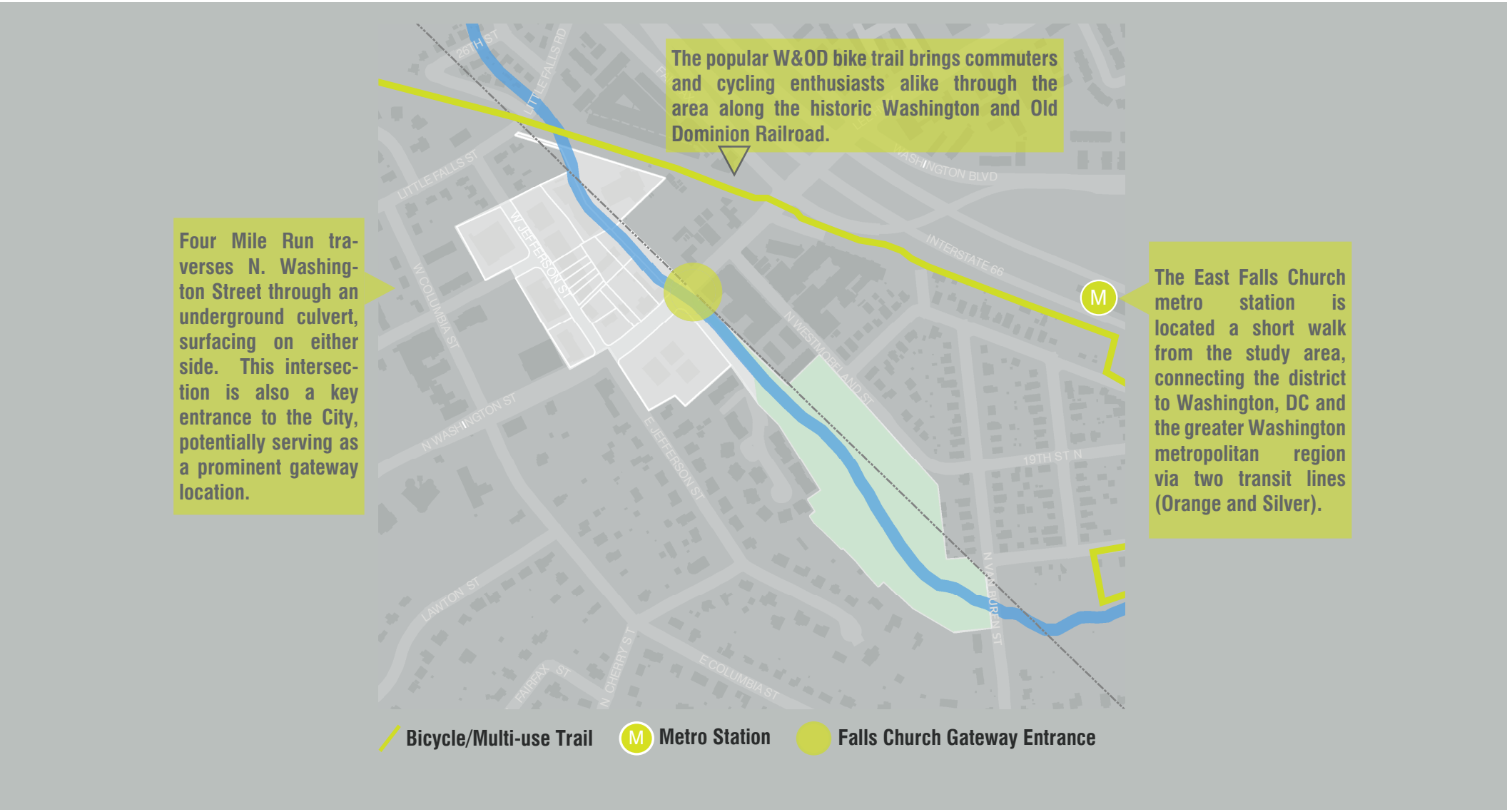
STUDY AREA

The Four Mile Run Stream Restoration Action Plan focuses on an area that is 25.6 acres in size, directly adjacent to the approximately one-half-mile segment of Four Mile Run within the City. This area was defined as a priority for redevelopment in the 2012 North Washington Street Plan and is part of the northern gateway into the City. The northern and western borders are delineated by the Arlington County boundary line, and parcels owned by Falls Church within Arlington. The southern boundary ends at the southern extent of Crossman Park.

This headwater segment of Four Mile Run is further divided into Reach 1 and Reach 2 within the study area boundary. Reach 1, to the north, consists of the area from where the branch first enters the City of Falls Church to North Washington Street and is bordered by commercial, industrial and public (fire station) uses. Reach 2 consists of the area between North Washington Street and the southern extent of Crossman Park, surrounded primarily by existing parkland.




LITTLE FALLS
FAIRFAX DR
LEE HWY
WASHINGTON BLVD
INTERSTATE 66
REACH 1
REACH 2
W JEFFERSON ST
W COLUMBIA ST
N WASHINGTON ST
N WESTMORELAND ST
E JEFFERSON ST
19TH ST N
CHERRY ST
0
350
Feet
City Boundary
Four Mile Run
Crossman Park


The popular W&OD bike trail brings commuters and cycling enthusiasts alike through the area along the historic Washington and Old Dominion Railroad.
Four Mile Run traverses N. Washington Street through an underground culvert, surfacing on either side. This intersection is also a key entrance to the City, potentially serving as a prominent gateway location.
The East Falls Church metro station is located a short walk from the study area, connecting the district to Washington, DC and the greater Washington metropolitan region via two transit lines (Orange and Silver).
M
26TH ST
LITTLE FALLS RD
LITTLE FALLS ST
WASHINGTON BLVD
INTERSTATE 66
W JEFFERSON ST
W COLUMBIA ST
N WASHINGTON ST
N WESTMORELAND ST
E JEFFERSON ST
19TH ST N
N VAN BUREN ST
LAWTON ST
FAIRFAX ST
N CHERRY ST
E COLUMBIA ST
Bicycle/Multi-use Trail
M
Metro Station
Falls Church Gateway Entrance


The joint Falls Church-Arlington Fire Station is owned by the City of Falls Church.
Several medium-high density, mixed use developments have recently been constructed just outside of the study area.
One of the four original boundary stone markers (dating back to 1791) for the District of Columbia still remains today.
F
B
LITTLE FALLS ST
WASHINGTON BLVD
INTERSTATE 66
W JEFFERSON ST
N WESTMORELAND ST
N WASHINGTON ST
E JEFFERSON ST
19TH ST N
LAWTON ST
N CHERRY ST
E COLUMBIA ST
Fire Station
Recent Mixed-Use Development
Boundary Stone

STREAM HISTORY

1980
Downstream portion of Four Mile Run in Alexandria/Arlington channelized.[1]

1985

1990

1991
A Metropolitan Washington Council of Governments draft study on Four Mile Run stated "upstream channelization will eliminate pools and riffles and 'exacerbate the physically and ecologically damaging' water patterns."[2]

1991
"Falls Church Wants Clean Streams" Local filmmaker Dave Eckert recalls, "one section of Four Mile Run had so much gasoline in it ten years ago that it caught fire." The federal government spent $140,000 to clean up a leaking underground tank. Eckert thinks Four Mile Run can be restored if, "pipes are capped, oil tanks are removed, and city planning officials require new development to keep the stream clean."[3]

1992
Arlington County wants to enlarge a culvert along Four Mile Run near the Falls Church boundary. Local environmentalists recommend constructing a stormwater detention pond near the city border to regulate flow of Four Mile Run.[4]

1992
"Troubled waters divide Arlington and Falls Church."
Arlington residents want Four Mile Run channelized due to frequent flooding. The Village Preservation & Improvement Society (VPIS) hopes to see the urban stream valley become a park. VPIS conducted a study for planting trees and native plants in the 5-acre park.[5]

1992 - 1993
VPIS celebrates stream accomplishments: two cleanups; petition and discussion with the City develop a comprehensive watershed management plan; establishment of Water Resources Commemorative Fund.[6]

1993
"Falls Church firm cited for spill." Combustible petroleum oil was found leaking into Four Mile Run from the property of a Falls Church construction company.[7]

1995

1. City of Falls Church, "Parks for People, Parks, Open Space, and Recreation Chapter of the City's Comprehensive Plan." City of Falls Church, February 2015. PDF Online.
2. Northern Virginia Sun, "A Washington Council of Governments Draft Study on Four Mile Run," Northern Virginia Sun (Arlington, VA), December 1991. Print.
3. Northern Virginia Sun, "A Washington Council of Governments Draft Study on Four Mile Run," Northern Virginia Sun (Arlington, VA), December 1991. Print.
4. Debra Lynn Vial, "Falls Church Wants Clean Streams," The Journal (Arl, VA), April 8, 1991: A3. Print.
5. Yvonne French, "Troubled Waters Divide Arlington and Falls Church," Northern Virginia Sun (Arlington, VA), February 4, 1992: 1+. Print.
6. Village Preservation and Improvement Society, "VPIS Natural Resources Executive Committee July 1992-June 1993 Accomplishments," (Falls Church, VA), June 1993. Print.
7. Bill Taggart, "Falls Church Firm Cited for Spill," Northern Virginia Sun (Arlington, VA), March 25, 1993: 1+. Print.
8.
9. "Metro in Brief." The Washington Post. Washington, D.C. September 9, 1998. p. B3. Retrieved from http://www.lexisnexis.com.ezproxy.lib.vt.edu/lnacui2api/api/version1/getDocCui?lni=3T-MX-3S50-007D-J058&csi=8075&hl=t&hv=t&hnsd=f&hns=t&hgn=t&oc=00240&perma=true
10. Four Mile Run: Reviving an Urban Stream. Directed by Dave Eckert. Falls Church, Virginia: Virginia Village Productions, 2001. DVD.
11. Mayor Tarter, Letter from FEMA to Mayor Tarter, November 3, 2014. On June 17, 2014 FEMA notified the City of "proposed flood hazard determinations affecting Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for the City of Falls Church., Virginia.

1998
Testing for stream pollutants to expand. A long-term regional effort of testing is established between Alexandria, Arlington, Falls Church, and Fairfax city/county officials.[9]

2000

2005

2010

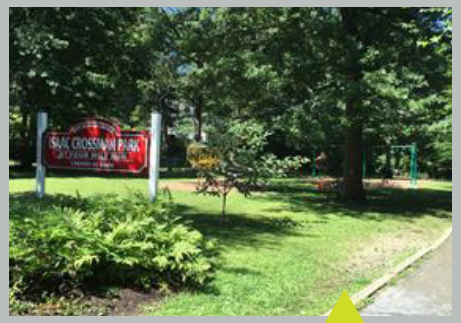
1996
Four Mile Run placed on the EPA's Impaired Waters List for failing to meet water quality standards for fecal coliform bacteria.[8]

2001
"Four Mile Run: Reviving an Urban Stream," a documentary about the history and condition of the stream, was completed.[10]

2014
On November 3, 2014 Mayor Tarter received a letter from the Federal Emergency Management Agency (FEMA) stating the City's 90-day appeal period regarding the flood plain boundary had ended.[11]

RELEVANT PLANS & STUDIES

Crossman Park Plan



2005

Crossman Park is both a neighborhood park and natural resource area surrounding Four Mile Run. Crossman Park is a prime example of how Four Mile Run in Falls Church needs to be restored in order to become an "example of a well-managed forest and wetland biological habitat, used by the City of Falls Church as an educational resource."

4MR Restoration Master Plan

2006

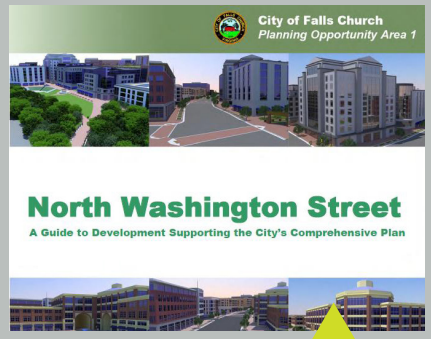
"Four Mile Run Restoration Master Plan" is created by the County of Arlington and the City of Alexandria to guide intense redevelopment downstream from Falls Church, setting high ecological and aesthetic standards.

West Jefferson Street Conceptual Plan

2010

The Virginia Tech West Jefferson Street Conceptual Plan outlines proposed redevelopment of several blocks immediately west of North Washington Street along Four Mile Run, creating a vision of a high-density mix of uses with Four Mile Run as a restored centerpiece.

N. Washington Street Plan



2012

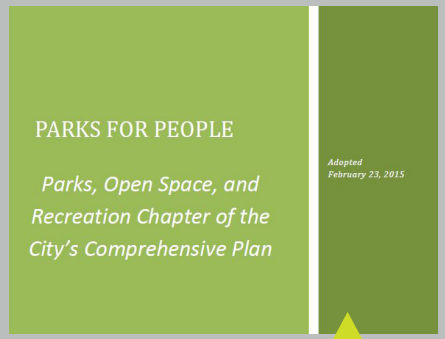
The North Washington Street Small Area Plan sets a course of denser, mixed-use development along this key commercial corridor and notes Four Mile Run as an untapped asset. The plan also calls for increased open space, primarily along the stream and in within the Resource Protection Area.

Watershed Management Plan

2012

This is a comprehensive assessment of infrastructure and waterways with recommendations for a variety of physical and policy improvements, including general restoration of Four Mile Run. Additionally, it identifies smaller improvements for sites within the study area that flow in or are related to Four Mile Run.

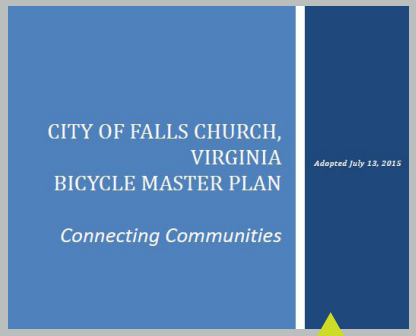
Parks for People Chapter (Comprehensive Plan)



2015

The Parks for People Chapter of the Comprehensive Plan finds that parks, open space, and recreational facilities are "critical components of a community's quality of life and the health of its citizens, and parks provide social, environmental, and economic benefits." Ideally the Parks for People Plan is to be utilized as an "official policy guide" that shapes the location and use of future open space.

Bicycle Master Plan



2015

This plan sets a vision to"connect the City's commercial areas and neighborhoods, transit facilities, schools, regional bicycle facilities, and designated bicycle routes in neighboring jurisdictions." The W&OD Trail crosses Four Mile Run and connects to North Washington Street and neighboring Arlington County. Restoring the banks of Four Mile Run would improve trail connectivity among neighboring communities and commercial districts.

2015

This Four Mile Run Restoration Plan builds on the analyses, visions and goals set forth in the prior planning and policy documents. This plan sets forth an actionable framework for restoring Four Mile Run near its headwaters, expanding public recreational amenities and spurring a revitalized North Washington Street district.

4MR

FOUR MILE RUN

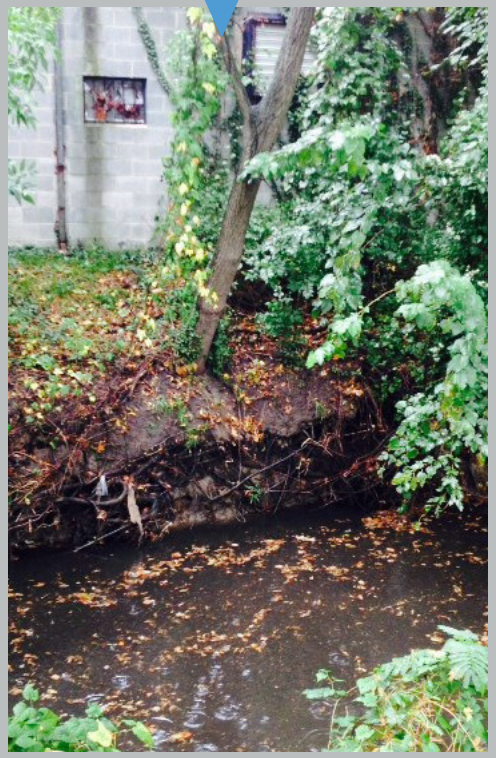
GO THE EXTRA MILE

TODAY

EXISTING STREAM CONDITIONS

Four Mile Run in the City of Falls Church has been altered through the years to accommodate high flows, infrastructure, and daylighting. There are areas of potentially problematic stagnant water, overtaking invasive species, and poor water quality due to point- and nonpoint-source pollution. Approximately 60-80 percent of vegetation at the stream consists of more than 20 species of invasive plants. E. coli and other contaminants have been measured as exceeding total maximum daily loads (TMDLs) at Banneker Park monitoring station in Arlington, meaning impaired water quality throughout the stream. All of these factors indicate the need for the restoration of Four Mile Run in Falls Church. More information on stream conditions and water quality can be found in Appendices A and B, respectively.

Eroded stream banks and walled edges.



Stormwater discharge

Stream alterations

Invasive Plant Growth

English Ivy

Amur & Japanese Honeysuckle

Grape

Multiflora Rose

Mile-a-Minute

STREAM RESTORATION 101

Streams are complex ecosystems that serve multiple functions and provide a variety of values to their surrounding area. Several functions provided by streams include natural flood control, groundwater recharge, nutrient recycling, and the maintenance of biological diversity and productivity downstream. Streams also provide habitats for a variety of plants, animals, and microbes. However, as streams become polluted and altered through infrastructure changes, the integrity is diminished. Small human impacts to streams quickly coalesce to cause significant functional impacts.

Common problems associated with urban and suburban streams include: increased nutrient loads, loss of tree canopy cover, excessive sediment, chemical contamination, erosion, an increase in impervious surfaces in the watershed and infrastructure changes in and along the stream. Typical infrastructure changes to the stream include installation of culverts and bridges, filling or relocating a stream, channelization, placing hardening agents on stream banks, impounding, and piping the stream.

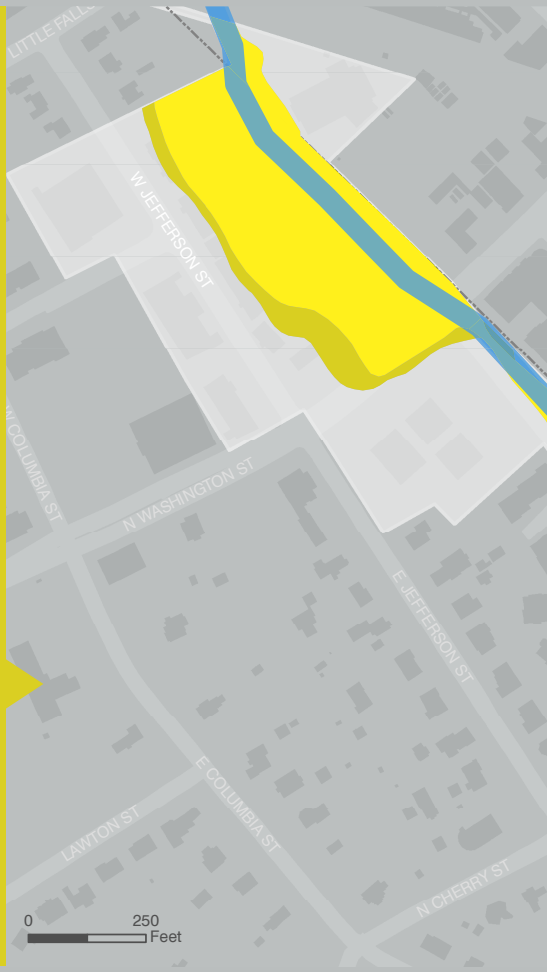
Common solutions to restore impaired streams are based on the idea of Natural Channel Design. This design seeks to restore a degraded stream by mimicking the characteristics of a stable natural system. Restoring the stream re-establishes the general structure, function and self-sustaining behavior of the stream system that existed prior to disturbance, enhancing both the stream's ability to handle stormwater runoff as well as its aesthetic appeal.

RESOURCE PROTECTION AREA

Resource Protection Areas (RPAs) provide a natural buffer for waterways by limiting the amount of impervious surface. The RPA covers about 12.4 acres of the study area, 1.8 of which are recommended for acquisition.

FLOODPLAIN

FEMA designates floodplains based on the 1 percent likelihood that the zone will be flooded in 100 or 500 years. About 12.3 acres of floodplain are located within the study area. If land use changes, a Letter of Map Revision (LOMR) will be needed from FEMA.



RPA

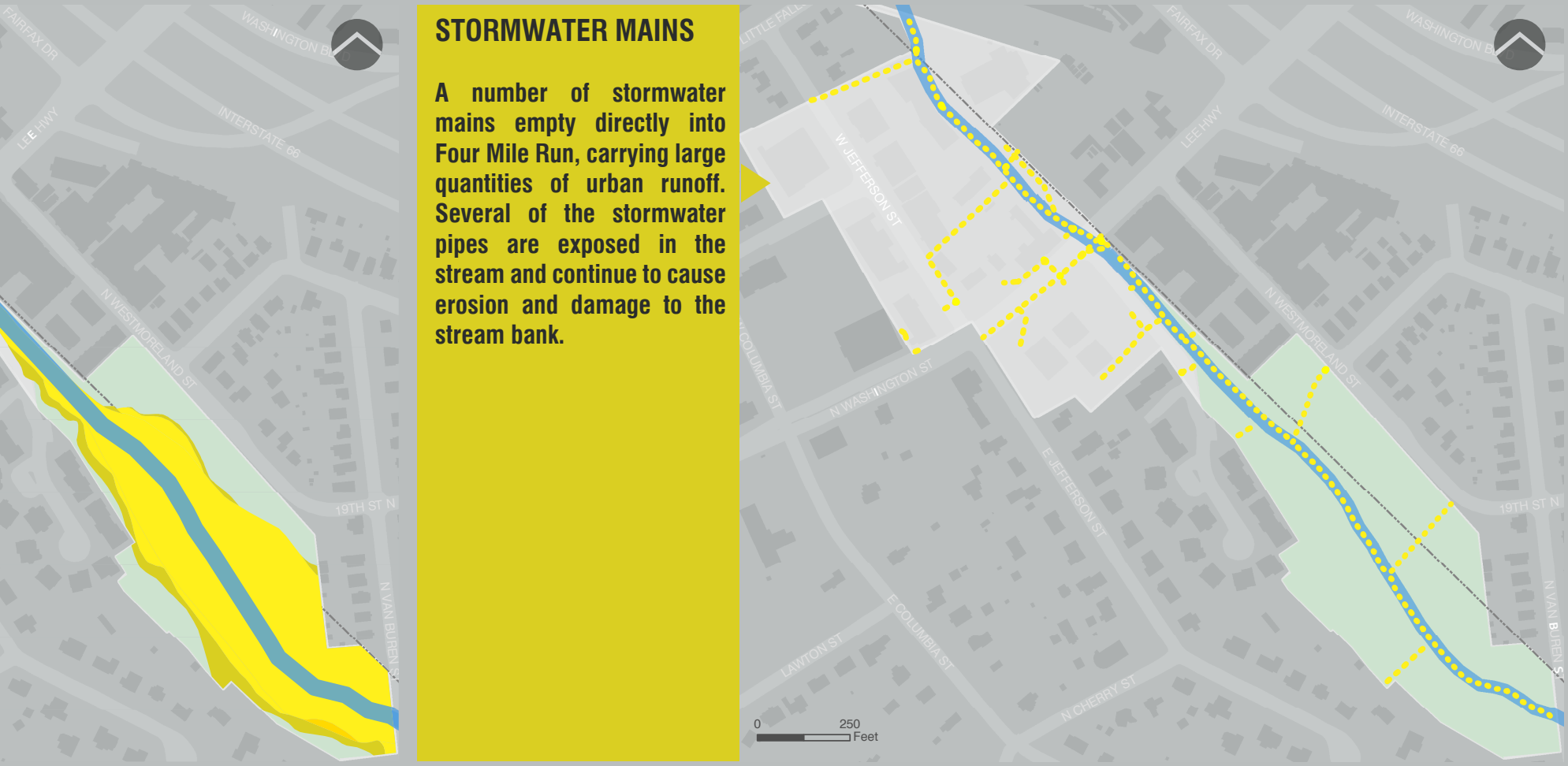
RPA Recommended for Acquisition

100 Year Floodplain

500 year floo

STORMWATER MAINS

A number of stormwater mains empty directly into Four Mile Run, carrying large quantities of urban runoff. Several of the stormwater pipes are exposed in the stream and continue to cause erosion and damage to the stream bank.



dplain

Stormwater Pipes

Data Sources:
City of Falls Church Opendata 2015
Arlington County 2015
ArcGIS online 2015
FEMA 2015, USDA 2015

EXISTING LAND USE CONDITIONS

With the exception of two office space parcels, all of the existing land use in the study area is either individual retail/service or light industry/ automotive. As stated in the North Washington Street Small Area Plan, there are few residential properties and very little dedicated open space, as the area consists primarily of low-density, auto-oriented development in small buildings with long setbacks and large surface parking lots relative to the lot size. Also, as expressed in the Small Area Plan, light chemical runoff into Four Mile Run is a concern, given the proportion of impervious surface and the perpetual presence of parked cars in various states of repair.


KMC
Dashboard Lights
Wiring Harness Replace
Steering Columns
Auto Computer
Key Programing
Transmission Specialist
& General Auto Repair
703-203-8119

ZONING

There are three zoning categories within the study area. The primary limitation with the current zoning is that it permits low-density, auto-oriented development that is incompatible with goals of restoring the stream and creating mixed-use development. Mixed-use development can be achieved only through special exception under the current zoning conditions. The M-1 zoning designation allows low-density, single-use industrial development, including auto-oriented and drive-through businesses. B-3 zoning district allows office, retail, restaurant, and motor vehicle repair and sales, among other uses.

All of the land in the study area is slated for mixed-use development. In order to achieve this, and to eliminate incompatible by-right uses, such as motor vehicle repair shops, the Small Area Plan calls for changing M-1 to B-1, and B-3 to B-2, Central Business. While these changes will not allow for mixed-use development by-right, they will encourage the redevelopment of existing auto-oriented businesses and development that is more compatible with the vision of a vibrant, pedestrian-oriented neighborhood with park space adjacent to the stream.

PROPERTY OWNERSHIP

The majority of parcels in the study area are owned by one family (Jennngs). With the exception of the building owned by the John Clayborne Trust, all the other commercial spaces in the study area are occupied by tenants.

The Gateway parcel at 500 North Washington Street contains three commercial office buildings owned by Inova Health, with tenants including Verizon, the Armed Forces and a family dentist practice. The Verizon lease is valid through 2025; however, new tenant leases are being offered only in five-year increments, and extensions carry a six-month termination clause.

The Jennings are generally supportive of stream restoration and redevelopment of their property; however, before moving forward, they are looking for a joint venture partner to assist with the drawing plans, as well as improved market conditions. Consolidating parcels on their block and receiving entitlements are challenges; reconstruction is more likely if a development team specializing in mixed-use development and stream restoration were to prepare plans for the site and establish a partnership with property owners.

ADDRESS	OWNER	ACRES	ZONING DISTRICT	LAND VALUE	IMPROVEMENT VALUE	TOTAL VALUE
114 W JEFFERSON ST	JEFFERSON ST II LLC	1.03	M-1	$2,281,700	$779,500	$3,061,200
140 W JEFFERSON ST	UGONE, CURTIS	0.72	M-1	$1,608,400	$584,800	$2,193,200
112 W JEFFERSON ST	JEFFERSON ST II LLC	0.21	M-1	$456,800	$125,400	$582,200
108 W JEFFERSON ST	SILBER, GLADYS & MAUCK, LISA S	0.1	M-1	$212,900	$100,900	$313,800
106 W JEFFERSON ST	HIRSCH, MARY JANET JENKINS	0.13	M-1	$285,700	$126,200	$411,900
104 W JEFFERSON ST	MCMANAMAY, LINDA	0.09	M-1	$190,800	$89,300	$280,100
102 W JEFFERSON ST	JEFFERSON ST LLC	0.11	M-1	$242,800	$134,700	$377,500
553 N WASHINGTON ST	L K S ASSOCIATES	0.35	M-1	$925,400	$91,800	$1,017,200
N WASHINGTON ST	L K S ASSOCIATES	0.24	M-1	$524,300	$20,500	$544,800
100 W JEFFERSON ST	JOHN CLAYBORNE REVOC TRUST	0.21	B-3	$465,800	$153,600	$619,400
501 N WASHINGTON ST	SAAH, NAHI I	0.33	B-3	$925,900	$143,500	$1,069,400
531 N WASHINGTON ST	FRANK N KRASEVIC JR REVOC TRUST	0.22	B-3	$615,500	$23,000	$638,500
537 N WASHINGTON ST	L K S ASSOCIATES	0.48	B-3	$1,267,100	$31,400	$1,298,500
551 N WASHINGTON ST	L K S ASSOCIATES	0.32	B-3	$829,800	$47,700	$877,500
500 N WASHINGTON ST	FALLS CH GATEWAY ASSOCIATES LLC	2.59	T-2	$6,765,800	$2,109,900	$8,875,700
435 N MAPLE AVE	NORTH MAPLE LLC	1.27	M-1	$2,813,400	$2,298,400	$5,111,800
101 W JEFFERSON ST	JENNINGS MINNIE B LLC	0.55	M-1	$1,215,400	$739,800	$1,955,200
467 N WASHINGTON ST	ZLOTNICK & KRAFT ALEXANDRIA LLC	0.44	B-3	$1,150,200	$308,400	$1,458,600

The parcels within the study area are well-positioned for redevelopment to higher intensity, community-oriented, mixed uses. The current land improvements and structures are underperforming when compared to the high value of the land. The dominant industrial land uses are polluting to Four Mile Run and the watershed, and are unattractive to pedestrian and retail activity. Furthermore, because many parcels are held under common ownership, the sites are poised for property assemblage and block-scale re-design and development.

4MR

FOUR MILE RUN

GO THE EXTRA MILE

IMPLEMENTATION

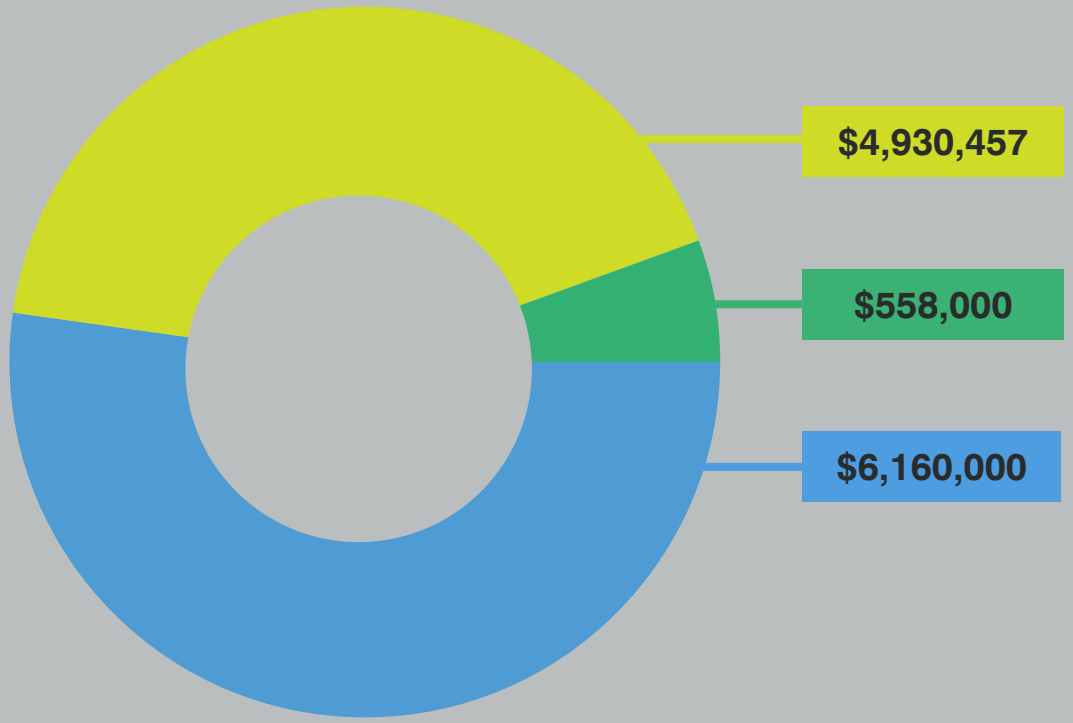
ESTIMATED COSTS

Scope of Improvements

To glean the most value from Four Mile Run restoration in Falls Church, it should be ntegrated with community revitalization. The scope of stream restoration should include expansion of public open space and access to the stream that relates to future mixed use development of the surrounding area.

This requires that land necessary for restoration and park improvements be acquired; stream restoration design, construction and monitoring program be completed; and park design and construction be completed. The total value of these tasks is estimated at about $12 million.

Methods and assumptions for these estimates can be found in Appendix C.



LAND ACQUISITION

One step the City can take in restoring Four Mile Run is to work with the development team to acquire most of the land within its Resource Protection Area (RPA) using some of the mentioned financial tools. The RPA is relatively small--less than two acres total, but requires the significant commitment of financial resources of about $5 million.[1]

The data used to calculate the total value of land within the RPA was collected by the City of Falls Church online Parcel Viewer. The Parcel Viewer also provides land and building value data from the City Assessor's office. The most recent data year, 2015, was used in calculating the overall value of the RPA.

1. City of Falls Church, Virginia. "Parcel Viewer." Accessed October, 2015.

STREAM RESTORATION

The cost of a stream restoration project depends on many factors. While stream restoration projects in rural areas can cost as little as $700 per linear foot (LF), this project will cost between $1,400-1,500/LF, or an estimated cost of $6 million for the 4,000-foot section of Four Mile Run within the City. This estimate includes assessment, construction, and post monitoring activities.[1, 2]

Total cost of restoration is estimated at $6.2M, with stream assessment ranging from $100-$115 per linear foot (LF), construction at about $1300/LF, construction oversight at about $75/LF, and post-monitoring and maintenance at roughly $50/LF.

1. Virginia Department of Conservation and Recreation. Division of Soil and Water Conservation. "The Virginia Stream Restoration & Stabilization Best Management Practices Guide." 2004.
2. Interview Conducted with George Rhodes, Stantec Corporation.

PARK DEVELOPMENT

The cost to build a new public park within the RPA will depend on the its program and amenities.

Based on a cost estimate of nearby West End Park within the City, the new green space park that could be built within the RPA will be about $480,000.[1,2] The City should also factor in a 10 percent contingency fund for the overall cost of the project and another $30,000 for potentially adding a rain garden. Overall, the cost to build a new public park will be about $558,000.

1. City of Falls Church, Virginia. "West End Park Improvements." Accessed December 2015. http://www.fallschurchva.gov/1511/West-End-Park-Improvements.
2. Email correspondence conducted with Daniel Schlitt, City of Falls Church Parks and Recreation Department. October 28th, 2015.

IMPLEMENTATION STRATEGIES

Restoration of Four Mile Run will be achieved concurrent with redevelopment of surrounding parcels. Land acquisition, design and construction of the stream restoration and park improvements should be accomplished through a partnership the City of Falls Church, property owners and developers.

Ownership of the parcels that comprise the study area is currently fragmented. It is therefore in the interest of the City to facilitate consolidation of these properties for a development site. The City should also work to facilitate private sector investment in redevelopment of the subject site. Finally, while developer contribution is recommended as the primary means of financing land acquisition for restoration, it will likely not cover the total cost of improvements. Therefore, it is essential for the City to consider alternative sources of funding for stream restoration and any ancillary costs. Several tools the City can use to achieve the goals of restoration are outlined here. These are not listed in any particular order.

Tools for Consolidation & Redevelopment

Land Banking Fund

The Economic Development Authority (EDA) Land Banking Fund is the preferred alternative to consolidate the parcels adjacent to Four Mile Run and facilitate expedited private development. The fund can be used to acquire land or development rights or be employed in public-private partnerships for land development.[1] However, for this source of funding to be used, the City needs to demonstrate that redevelopment is only feasible through land assembly. As of October 2015, the fund had $1.8 million.[2] The EDA may designate and place potential money into the fund upon Board approval by majority voting. The land banking fund is guided by policy and managed by the EDA.

1. Paul Stoddard, email message to Shelley Mastran, October 28, 2015.
2. City Manager Wyatt Shields to Mayor and City Council, EDA Land Banking Internal Memorandum, January 31, 201.

Public-Private Partnership

A public-private partnership is a broad term that refers to any arrangement between a public entity and a private entity to finance, construct, or manage a project whereby both the benefits and risks are shared between both parties.[3] The City should explore making public investment in redevelopment of the Four Mile Run study area. This includes the use of public financing options for the development, flexible zoning in the special exception process, and a streamlined public review process. However, such a partnership should focus on accomplishing the stated City goals of facilitating commercial investment in the City.

Tax Increment Financing (TIF)

The use of TIFs has been evaluated previously by the City as reflected in the North Washington Street Small Area Plan (SAP). A

3 Russel, Edward "Public-Private Partnerships Work for Some Infrastructure, Just Not All" Greater Greater Washington January 8, 2015 http://greatergreaterwashington.org/post/25212/public-private-partnerships-work-for-some-infrastructure-just-not-all/

pay-as-you-go method, which relies on the developer to pay for the up-front project costs with the promise of being reimbursed, is a preferable option compared to bonds.[4] Bonds carry obligation.[5] TIFs have been established along with Community Development Authorities (CDAs) (a type of public-private partnership) to generate additional revenue. A substantial tax base will need to be created to make a TIF possible. However, TIFs could potentially be used to fund infrastructure that catalyzes private development, such as an underground public parking structure.[6]

Transfer of Development Rights (TDR)

The North Washington Street SAP mentions that TDR could be relevant in the Four Mile Run area given the environmental resources recommended by the plan for protection. TDR could be a useful tool for allowing developers to recoup the value of the density they would lose from the loss of buildable area within the RPA on site. In this scenario, the owners of the parcels on which the RPA is located would certify the density able to be achieved if the RPA did not restrict development. The City would designate this area a 'sending site' and the developer would be able to sell the density to the owners of a 'receiving site' located elsewhere in the city.

Industrial Revenue Bonds

Tax-exempt or taxable revenue industrial revenue bonds (IRBs) could provide enticement to suitable developers without requiring capital investment from the City or sacrifices of tax revenue. This creates a mutually beneficial situation in which developers obtain financial support to initiate projects and the City plays an active role in achieving its vision.

There is precedent in Falls Church: the EDA issued a combination of tax-exempt and taxable IRBs, totaling $25 million, to finance the construction of the Tax Analysts building. For this case, interest rates made IRBs an attractive financing mechanism, with no-default liability for the City or the EDA.[7] IRBs could similarly be used in the Four Mile Run area.

Arts and Culture District

The North Washington Street SAP recommends establishment of an Arts and Culture District. Economic incentives can attract businesses and institutions, while developers would be obligated to incorporate cultural elements into their projects through special exception requirements. The November 2015 issue of Planning magazine ("When Arts and Culture Take Center Stage") recommends steps for effective arts and culture planning. It lays out a toolkit that includes the "planning process: preparation, assessment, and implementation, with participation and input from stakeholders, community groups, and

4. City of Falls Church. "Incentives for Development: A Summary"
5. WIlliam Nusbaum. "Financing Tools Available to Virginia Localities to Facilitate Economic Development and Redevelopment", http://www.cpe.vt.edu/vida/presentations/05.21.1000am-BNusbaum.pdf
7. Rick Goff, interview by Lida Aljabar, Charles Egli, Matthew Pfeiffer, and Jimena Pinzon, October 13, 2015.
7. "Incentives for Development: A Summary." (Unpublished document, Falls Church EDA, 2015).

the public a key feature of each."[1]

Stream Restoration Funded with Community Benefit Dollars

It is anticipated that the costs of Four Mile Run stream restoration and park development will be covered primarily by the value gleaned from redevelopment of the parcels along West Jefferson Street. These voluntary contributions will be community benefits associated with the special exception redevelopment negotiated by the City and developers.

As a component of a potential B-2 Special Exception application, the City could negotiate a community benefits package that addresses the impacts of the proposed development and/or achieves the vision of the North Washington Street SAP. Land, cash, or construction of stream improvements should be part of that package.

1. Kreyling, Christine. "When Arts and Culture Take Center Stage." Planning, November 2015.

City EDA staff have prepared an exhibit detailing the values accrued to the City from community benefits packages approved with eight recently approved mixed-use special exception projects. Community benefits are negotiated on a site-by-site basis. The following chart provides a summary of the figures compiled by the City.

Assuming that contribution dollars at the subject sites are comparable to average values as listed in the chart on the previous page, voluntary developer contributions may not cover the full costs of stream restoration, considering typical contributions for undergrounding, schools and affordable housing. The City will need to consider community priorities in dedication of these funds.

Major Contributions	Valuation (avg. in 2015 dollars)
Utilities undergrounding (per linear foot)	Approx. $4,200
Public school capital fund contribution (per unit)	$5,777
Affordable housing (per unit)	$213,883
Total community benefits package	$3,362,685.25
Community benefit contribution per housing unit	$23,976 avg.
	$13,303 - $31,076
Community benefit contribution per square foot of development	$15.21 avg.
Range of community benefit contributions per square foot	$5.80 - $15.59

STRAWBERRY RUN
ALEXANDRIA, VA

Strawberry Run was entirely restored by a developer through subdivision approval.

The total expected dollar value for the community benefits package for the subject project is roughly $5.5 million, using the average of the value per square foot numbers provided by the City. This figure is based on a developable site area of 120,661 square feet (excluding the area of the RPA, which cannot be built upon).

HAWKSBILL GREENWAY
LURAY, VA

Development of Hawksbill Greenway was financed in part by several grants.

Assuming a typical mixed-use density of 3.0 FAR, total project gross floor area would total 361,983 sq. ft.

The estimated community benefit package of $5.5 million cited above would include all community benefits; therefore, only a portion of that contribution would be used for stream restoration. This is subject to negotiation between a potential developer and the City.

External Funding Sources for Stream Restoration

Grants

A significant portion of the project could be financed by grant funds and greatly reduce the City's total financial obligation. The key characteristics of each of the grants identified as appropriate for these projects have been captured in a matrix located in Appendix D.

Grants that are especially relevant to the proposed restoration in Falls Church include:

Stream Restoration

- Stormwater Local Assistance Fund (SLAF)
- Virginia Program
- Virginia Aquatic Resources Trust Fund (VARTF)
- Chesapeake Bay Restoration Fund
- 5 Star Restoration Program
- Transportation Alternatives Program

Land Acquisition

- Land and Water Conservation Fund
- Virginia Land Conservation Foundation
- Chesapeake Bay Stewardship Fund

Northern Virginia Conservation Trust

The City should consider partnering with the Northern Virginia Conservation Trust (NVCT) to obtain grant funds for stream restoration and land acquisition. NVCT has the ability to apply for money for land acquisition from the Virginia Land Conservation Foundation, as well as a number of other grant sources. The organization is also experienced with fundraising efforts and has connections with major donors. The Northern Virginia Conservation Trust has helped the City of Alexandria and Fairfax and Arlington Counties with the implementation of their open space plans.[2]

Virginia Clean Water Revolving Fund Storm Water Loan Program (Revolving Loan Fund)

To help finance the stream restoration project when City funds are not yet fully

2. Northern Virginia Conservation Trust. "NVCT Webpage" 2015. http://nvct.org/

available, Falls Church could borrow money from the DEQ's Revolving Fund Program at rates equal to or below current market interest rates. Loans may be made "to a local government for the purpose of constructing facilities or structures or implementing other best management practices that reduce or prevent pollution of state waters caused by stormwater runoff from impervious surfaces." The minimum loan amount eligible for this program is $50K and there is no maximum loan amount, meaning that 100 percent of eligible costs could be covered while the City is securing funding.[1]

Public Seed Money

The Falls Church community and other stakeholders can represent a powerful fundraising tool to help finance the stream restoration project. This option would entail very little in the way of out-of-pocket expenses for the City. It could be used to pay for significant portions of the project or smaller activities associated with the larger effort. Nationwide examples include $35K for a bike lane in Denver, CO; $25K for a historic statue in Pawtucket, RI; and $20K for a bike-share program in Kansas City, MO.[2] With the proposed stream restoration project, smaller amounts of money could be used to pay for paths and trails, park benches, water quality monitoring labs, and other amenities that could bear the names of contributors.

CARROLL CREEK
FREDERICK, MD

A comprehensive flood management, trails and park development project was realized in Frederick, Maryland, primarily through significant capital investment by local, state and federal agencies.

Internal Funding Sources for Stream Restoration

Stormwater Utility Fee

The existing stormwater utility fund was evaluated as a potential source for stream restoration. From the City's 2015 Stormwater Utility Report, there are no additional funds for this project. During FY 2014, Falls Church received approximately $1.70 million in revenue and used $1.68 million on day-day operations from fees.

1. "Virginia Clean Water Revolving Loan Fund Storm Water Loan Program Guidelines." Virginia Department of Environmental Quality, Accessed September 20, 2015. http://www.deq.virginia.gov/Programs/Water/CleanWaterFinancingAssistance/StormwaterFundingPrograms/StormwaterLoans.aspx.

2. Lindsey, Drew. "Local Governments and Nonprofits Test Crowdfunding for Civic Projects." The Chronicle of Philanthropy. January 7, 2015. https://philanthropy.com/article/Local-Governments-and/152005.

Changes in revenue for FY2015 and FY2016 are expected to remain flat.[3]

The stormwater fees are calculated based on a site's impervious area. Currently, property owners pay $18.00 per 200 square feet of impervious surface. However credits may be obtained by installing and maintaining a stormwater management facility on the property or performing activities outlined in the Stormwater Pollution Prevention Plan.[4]

Capital Improvement Project (CIP)

To be considered for CIP, projects must cost more than $150K and have a useful life over five years.[5] Given its projected cost and useful life, the proposed stream restoration project qualifies for CIP funding consideration. Numerous CIP projects in Falls Church similar to stream restoration have already been funded, including a trail in Howard E. Herman Park (total project cost estimate, $634K), open space acquisition ($1M), the repair and replacement of a retaining wall located along Four Mile Run ($1.1M), and stormwater infrastructure improvement ($5.3M). Allocating these funds to a comprehensive project like the proposed stream restoration would remove the need to pay for individual, piecemeal projects that stem from a common issue.

3. Jason Windstrom, interview by Jimena Pinzon, November 11, 2015.
4. City of Falls Church, "Stormwater Utility Fee" July 27, 2015.
5. "FY2016-2020 Capital Improvements Program," City of Falls Church, Accessed September 20, 2015. http://www.fallschurchva.gov/cip.

CASE STUDIES

CARROLL CREEK
FREDERICK, MD

The Carroll Creek linear park was an urban park redevelopment project. The redevelopment occurred along a 1.3-mile-long channelized waterway that flows through the historic downtown area. The park has multi-use trails and brick paths, landscaping, water features, three bridges, an amphitheater and boating access.

Method:
Downtown Redevelopment
Flood-control improvements

Cost: $30 million

Primary Partners:
City of Frederick
Frederick County
State of Maryland

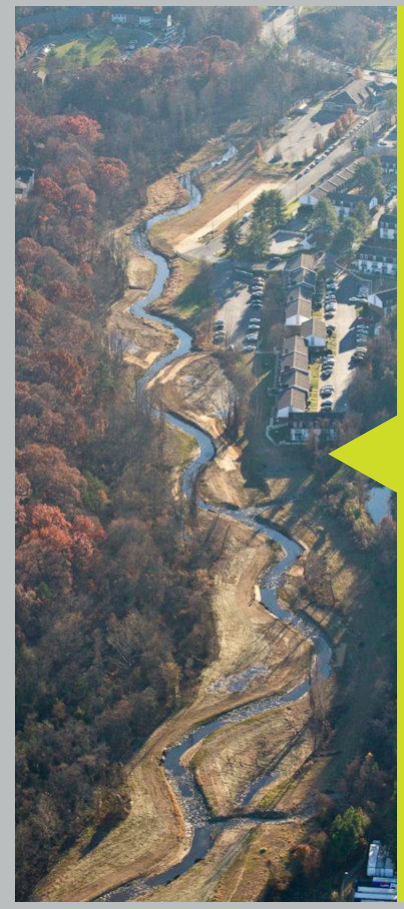
STRAWBERRY RUN
ALEXANDRIA, VA

Calvert Homes, Inc. voluntarily restored a 600' section of Strawberry Run in order to gain subdivision approval for a development adjacent to Fort Williams Park. The project involved stream bank stabilization, removal of non-native species, and removal of concrete debris in the stream channel.

Method:
Voluntary developer contribution

Cost: $160,000

Primary Partners:
Calvert Homes, Inc. (100% funding)
City of Alexandria



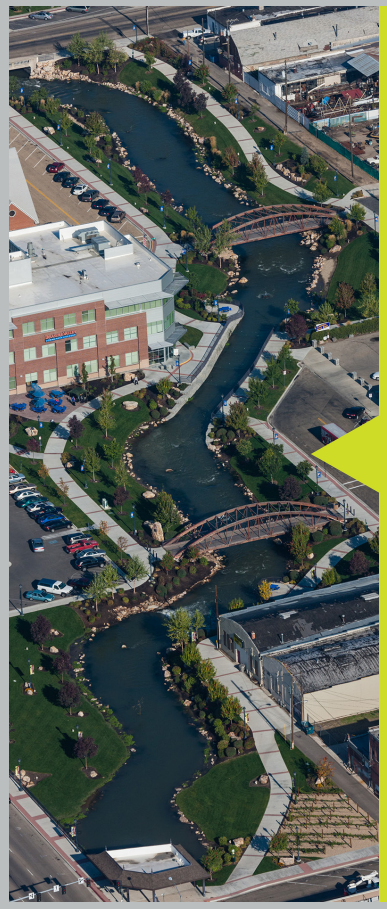
MEADOW CREEK
CHARLOTTESVILLE, VA

The Meadow Creek Restoration Project took place behind existing residential development. At over 72 acres, the project area included 10 acres of wetlands and 9,000 linear feet of degraded stream.

Method: The City of Charlottesville partnered with the Nature Conservancy to purchase land and secure easements, and restoration funding through the Virginia Aquatic Resources Trust.

Cost: $3.95 million

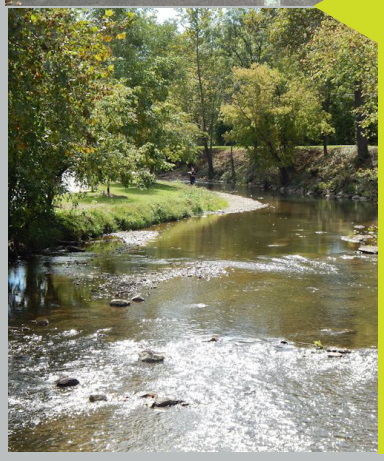
Primary Partners:
Virginia Aquatic Resources Trust ($3.68 M for restoration)
City of Charlottesville ($270,000)
Rivanna Water and Sewer Authority, Citizens of Greenbrier (land donations



INDIAN CREEK
CALDWELL, IDAHO

The City of Caldwell used the restoration of Indian Creek as a catalyst for downtown revitalization. The restoration of 1.5-mile greenway created a place for residents to live, work, play and shop .

Method: Downtown Redevelopment incentivized by Tax Increment Financing; other project costs covered by variety of local, state and federal funding, and private contrbutions.
Cost: $7.5 million
Primary Partners:
City of Caldwell
Trout Unlimited
Urban Renewal Agency
Caldwell East Urban Redevelopment Agency
US Dept. of Commerce, EPA, NPS, HUD (CDBG)
State of Idaho



HAWKSBILL GREENWAY
LURAY, VA

Four miles in length, Hawksbill Greenway runs through a downtown shopping district and residential neighborhoods. The restoration and greenway served as a catalyst for other projects, including parks, public art and the Downtown Initiative.

Method: Though most of the greenway is on public land, private land was included by donations, purchases, easements, condemnations and dedications.

Cost: $3.5 million

Primary Partners:
Town of Luray
VA DCR
VA Forestry

4MR

FOUR MILE RUN

GO THE EXTRA MILE

PLAN OF ACTION

ACTION STEPS

1

ASSESS
STREAM CONDITIONS

Conduct an official, comprehensive assessment of Four Mile Run, to include water quality, soil quality, flora, hydrology, stream structure, and riparian health.

2

PREPARE
PARCELS FOR REDEVELOPMENT

Partner with property owners, particularly the Jennings family, to identify private sector partners for redevelopment adjacent to Reach 1. Rezone the properties consistent with the N. Washington Street Small Area Plan, and adopt a Transfer of Development Rights ordinance to allow the owner to recoup the value of the RPA. Utilizing the Land Acquisition Fund, acquire parcels necessary for site consolidation.

3

CREATE
A VISION FOR RESTORATION AND REDEVELOPMENT

Work with the development team to create a vision for the area that builds on the vision of the N. Washington Street Small Area Plan, including mixed use development, park land, and stream restoration.

4

NEGOTIATE
PRIVATE INVESTMENT

Work with the development team during the special exception process to negotiate a community benefits package that includes a dedication of the RPA land in fee and a cash contribution to the City for stream restoration and park development.

5

DEVELOP A PLAN
FOR RESTORATION & PARK

Conduct a community planning process to develop a master plan and design for the park and restoration of Four Mile Run. The plan should include concrete steps to monitor and maintain the stream for long-term vitality.

6

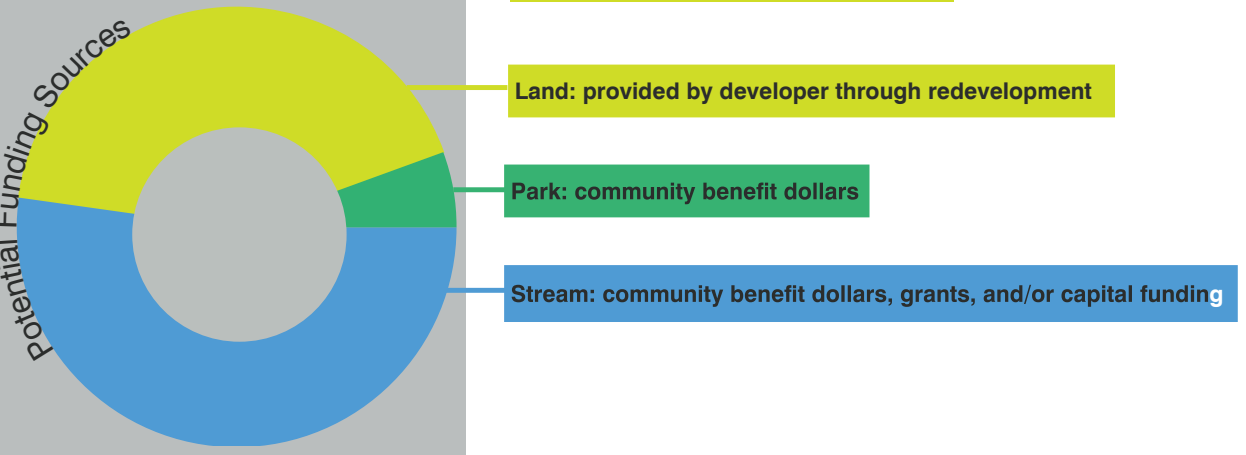
FINANCE
IMPROVEMENTS

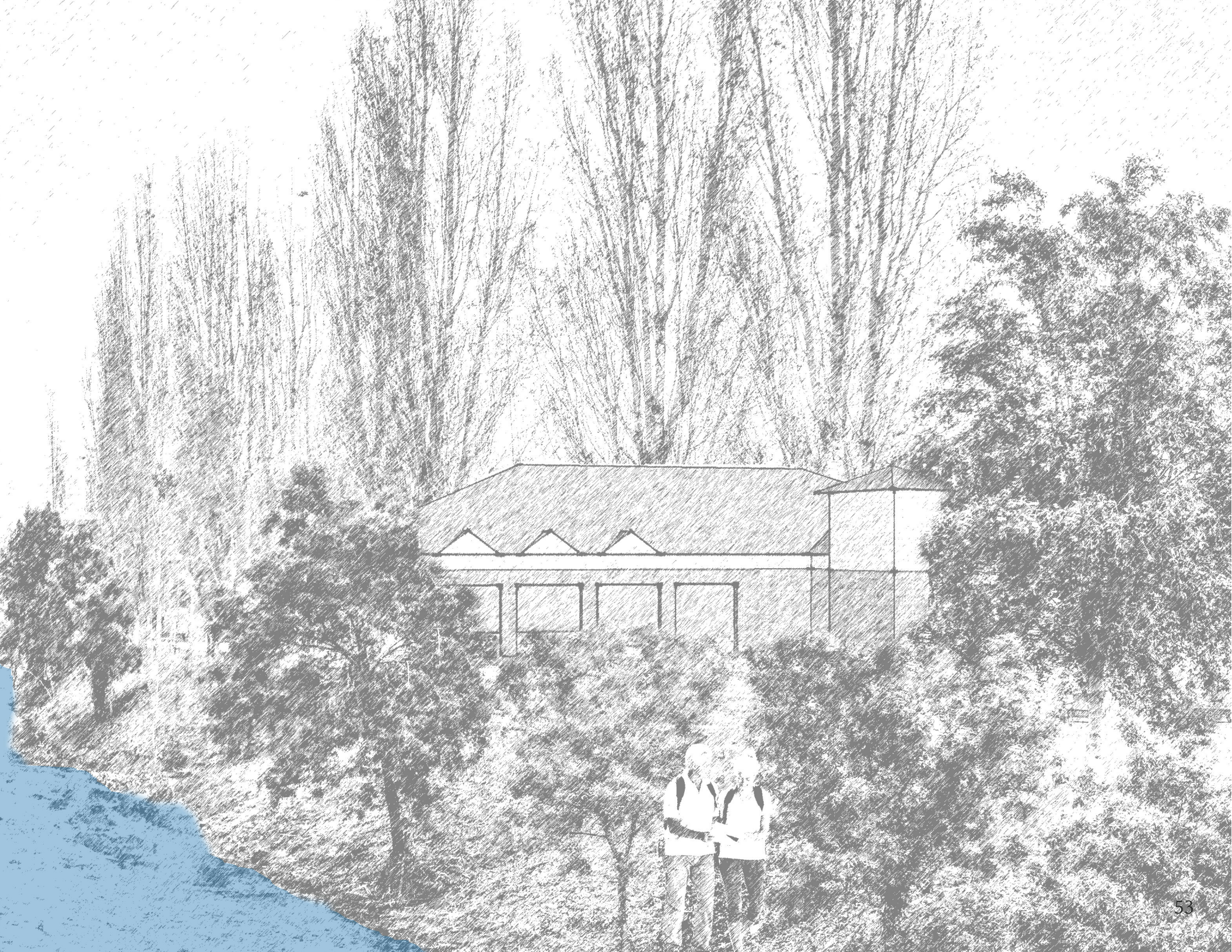
Identify finding sources to leverage private contributions, including grants, capital projects funding, and other sources identified in this Plan.

7

RESTORE
FOUR MILE RUN

Work with a contractor to restore the stream and build a public park along the restored Four Mile Run, in concert with the redevelopment of the adjacent W. Jefferson Street area.





PROJECT TEAM

URBAN PLANNING STUDIO
VIRGINIA TECH
DEPT. OF URBAN AFFAIRS & PLANNING

STUDIO DIRECTOR
Shelley Mastran

MURP CANDIDATES
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Jesse Mlcoch
Kerri Oddenino
Darnell Parker
Matt Pfeiffer
Jimena Pinzon
Tom Roberts
Heather Scharfetter
Adam Watson
Jon Wergin

DESIGN & GRAPHICS
Lida Aljabar
Darnell Parker
Jesse Mlcoch
Jon Wergin (stream illustration)

APPENDIX A: Environmental Conditions

I. Assessment of Four Mile Run in the 2012 City of Falls Church Watershed Management Plan

The City's 2012 Watershed Management Plan, prepared with the assistance of an advisory committee and AMEC Environment & Infrastructure, Inc., provides a comprehensive and detailed evaluation of the City's streams and other water conduits as well as infrastructure and its policy recommendations in the context of stormwater management. As a result of their analysis, AMEC recommended restoration of Four Mile Run. A number of the plan's recommendations have been adopted, such as the creation of a stormwater fee for landowners based on impervious area.

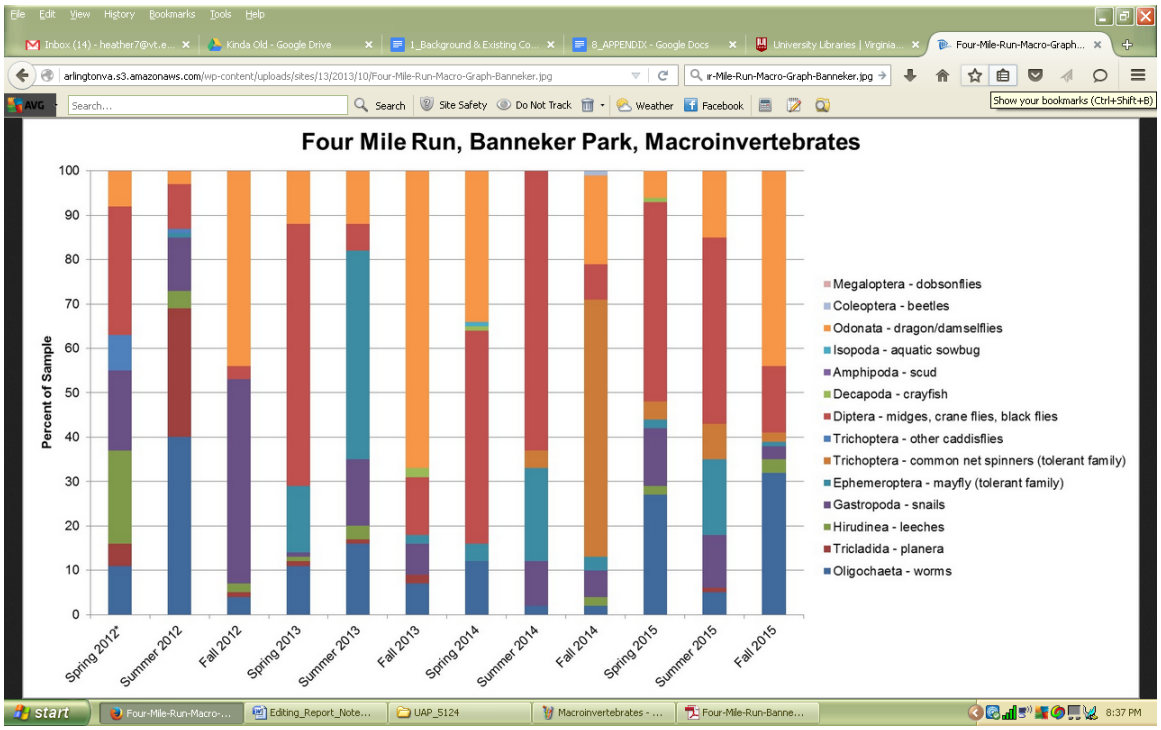
The plan also makes additional specific recommendations for smaller stormwater management projects on Four Mile Run and various tributaries to correct documented problems.

- Columbia and Underwood Streets (just outside present study area) flooding at intersection--recommend additional drain inlets and tree boxes to improve water quality
- Four Mile Run Stream culvert at Van Buren Street (downstream end of present study area)--recommend daylighting stream from existing culvert that runs under Van Buren Street to prevent periodic flooding from undersized culvert
- Columbia Street and Noland Street (one block from present study area)--insufficient capacity of drains; recommend adding drains and inlets
- Harrison Branch where it flows into Four Mile Run in Crossman Park--blowout around drain pipe; recommend daylighting, bank stabilization, step pools to slow water flow

II. Water Quality Details

Banneker Park Monitoring Station

Arlington County has been monitoring Four Mile Run at Banneker Park since 2001. The monitoring station is located near the border with Falls Church, at 1701 North Van Buren Street. Four Mile Run is designated as an impaired stream due to fecal coliform TMDLs exceeding state levels. This and other quarterly water quality testing has identified levels of macroinvertebrates associated with with impaired or poor water quality, including damselflies, flatworms, midges, net-spinning caddisflies, and small minnow mayflies. A high presence of midge organisms (quantity of 66) found in a quarterly sample from Spring 2012[i], indicate the presence of poor water quality with low dissolved oxygen, turbid waters, or nutrient enriched waters. A low presence of Cranefly and Damselfly organisms (quantity of less than 2 per species)[ii], indicate the presence of fair water quality. Stonefly or Water Penny organisms, which are indicative of streams with high water quality, were not found in quarterly samples. The most recent sample collection of macroinvertebrates, from October 28, 2015[iii], indicate the presence of 45 percent Odonata (dragon/damselflies), 13 percent Diptera (midges/craneflies), and less than 3 percent Trichoptera (net-spinners) and Ephemeroptera (mayfly) species. Again, these percentages represent fair water quality. The following table shows testing results from 2012-2015.



[i] Arlington County, "FMR3 Taxa List/Metric Summary Sheet Spring 2012," *Arlington County*. PDF Online. http://arlingtonva.s3.amazonaws.com/wp-content/uploads/sites/13/2013/09/Four-Mile-Run-Banneker-Park-Macro-Data.pdf.
[ii] Arlington County, "FMR3 Taxa List/Metric Summary Sheet Spring 2012."
[iii] Arlington County, "Four Mile Run, Banneker Park, Macroinvertebrates," *Arlington County*. October 28, 2015. PDF Online. http://arlingtonva.s3.amazonaws.com/wp-content/uploads/sites/13/2013/10/Four-Mile-Run-Macro-Graph-Banneker.jpg.

Appendix B: Water Quality Data

Figure 3-4b. FMR3 Taxa List/Metric Summary Sheet (Spring 2012)

Taxa List

Order/Major Group	Family	Genus species	Habit	Feeding Group	Tolerance Value	Quantity
Oligochaeta	Lumbriculidae	-	BUR	CG	8	5
Gastropoda	Planorbidae	-	CLI	SC	7	11
Gastropoda	Physidae	-	CLI	SC	8	7
Bivalvia	Sphaeriidae	Pisidium sp.	BUR	CF	8	1
Odonata/Anisoptera	Coenagrionidae	Enallagma sp.	CLM	PR	8	2
Diptera	Tipulidae	Tipula sp.	BUR	SH	4	1
Diptera	Simuliidae	Simulium sp.	CLI	CF	3	15
Diptera	Sciomyzidae	-	CLI	PR	10	1
Diptera	Chironomidae	-	BUR	CG	6	66
				Total Organisms Collected		**109**

Virginia Stream Condition Index Metrics

Water Quality Metrics	Value	
Total Taxa Richness (Family)	9	
EPT Richness (Family)	0	
Percent Ephemeroptera	0.0	
Percent PT-H	0.0	
Percent Scrapers	16.5	
Percent Chironomidae	60.6	
Percent Top Two Dominant Families	74.3	(Chironomidae, Simuliidae)
Family Biotic Index (DEQ)	6.40	FAIR
IBI Score	**25.3**	**SEVERE STRESS**

Fairfax Index of Macrobenthic Biotic Integrity (Piedmont)

Water Quality Metrics	Value	
Total Taxa Richness	9	
EPT Richness	0	
Percent EPT	0.0	
Percent T - H	0.0	
Percent Coleoptera	0.0	
Family Biotic Index (VERSAR)	6.43	FAIR
Percent Dominance	60.6	(Chironomidae)
Percent Clingers and Plecoptera	31.2	
Percent Shredders	0.9	
Percent Predators	2.8	
IBI Score	**32.5**	**POOR**

Benthic Index of Biotic Integrity for Maryland Streams (non-coastal)

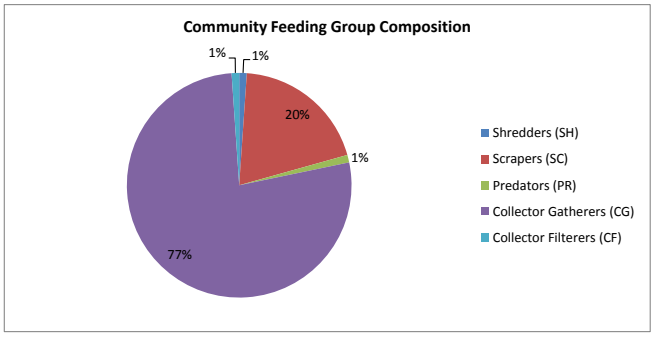
Water Quality Metrics	Value	Adjusted Score	
Total Taxa Richness	9	1	
EPT Richness	0	1	
Ephemeroptera Richness	0	1	
Diptera Richness	4	1	
Percent Ephemeroptera	0.0	1	
Percent Tanytarsini	0.0	1	
Intolerant Taxa Richness	1	1	
Percent Tolerant Taxa	24.8	3	
Percent Collectors	65.1	5	
IBI Score		**1.7**	**POOR**

Additional Metric Computations

Water Quality Metrics	Value	
Hilsenhoff Biotic Index (HBI)	5.98	FAIR
Simpson's Index of Diversity (SID)	0.60	
Effective Number of Taxa	2.48	

Feeding Group Community Distribution

Feeding Group	Quantity	Rel. Abundance (%)
Shredders (SH)	1	1
Scrapers (SC)	18	17
Predators (PR)	1	1
Collector Gatherers (CG)	71	65
Collector Filterers (CF)	1	1



Appendix C: Cost of Stream Restoration

Our analysis and consultation with multiple stream restoration contractors, such as Wetlands Solutions and Stantec, reveal that the cost to restore Four Mile Run within the City of Falls Church will be at the upper end compared with projects of similar size and scope. The main reason for this is the urban location which makes access to the stream more difficult for construction tasks.

Before any work can begin, the site will need to be thoroughly surveyed. After an initial assessment, a project will then be permitted by the City. The cost for this assessment period runs about $100-115/LF. The construction itself accounts for the majority of the cost, roughly $1,300/LF, and is heavily dependent on the ease of access. The earthwork accounts for about $1,200 of this and includes work such as bank protection/stabilization, grade control structures, and flow deflection techniques. The remaining construction costs come from the stakeout of the project, inspection, and production of as-built drawings after the construction has been completed. Full-time oversight of the construction by a member of the design/engineering team can add $75/LF to the project but may be worthwhile to ensure correct installation. Finally, ongoing monitoring and maintenance account for an addition $50/LF. Wetland Solutions gives this estimate assuming a monitoring period of five years.

Stream restoration is subject to economies of scale; therefore restoring a smaller section would result in greater costs per LF. On the other hand, coordination with Arlington County to restore a greater length of the run could be very cost beneficial. This option should be explored given the county's interest in the project.

As an example, the restoration of Indian Creek, mentioned earlier, cost $7.5 million or about $947 per LF. A more detailed discussion of Indian Creek can be found within the case studies section of this plan.

Land Parcels Within Resource Protection Area (RPA) - Four Mile Run

2015 Falls Church Assessment Data

RPC#	Owner	Acreage	Finished Square Feet	Land Value	Improved Value	Total Value	Acreage Within RPA	Estimated Value Within RPA
51-101-015	Ugone, Curtis	0.724	16540	$ 1,608,400	$ 584,800	$ 2,193,200	0.72	$ 2,193,200
51-101-004	LKS Associates	0.3541	4320	$ 925,400	$ 91,800	$ 1,017,200	0.18	$ 517,074
51-101-016	LKS Associates	0.236	NO DATA	$ 524,300	$ 20,500	$ 544,800	0.24	$ 544,800
51-101-019	LKS Associates	0.4848	3442	$ 1,267,100	$ 31,400	$ 1,298,500	0.22	$ 589,253
51-101-018	LKS Associates	0.3175	5130	$ 829,800	$ 47,700	$ 877,500	0.32	$ 877,500
51-101-010	Jefferson Street II LLC	1.0271	15000	$ 281,700	$ 779,500	$ 3,061,200	0.07	$ 208,630
							1.75	**$ 4,930,457**

Cost of Stream Restoration
Four Mile Run 4000 Linear Foot Section
City of Falls Church Virginia

Factors	Cost Per L/F		Total Cost
Assessment	$100-$115 L/F	$	460,000
Construction	$1300 L/F	$	5,200,000
Oversight	$75 L/F	$	300,000
Post-Monitoring	$50 L/F	$	200,000
Estimated Costs	**$1400 - $1500 L/F**	**$**	**6,160,000**

Estimated Cost of Restoration and Improvements
Four Mile Run
City of Falls Church Virginia

Factors	Cost
Cost of Stream Restoration	$6,160,000
Cost of RPA Land Purchase	$5,000,000
Cost of Park Construction Space	$650,000
Total Estimated Cost	**$11,810,000**

Appendix D: Grants Matrix

Name	Fund Amounts	Details	Example Projects
Stormwater Local Assistance Fund (SLAF) *Restoration projects* Virginia Department of Environmental Quality POC: Walter Gills walter.gills@deq.virginia.gov (804) 698-4133	**$100K - $5 Million** Per local government, minimum grant amount is $100K and maximum grant amount is $5 million. Requires a minimum of a 50 percent match, meaning projects must have at least $200K in eligible project costs, and any project that exceeds $10 million in eligible project costs will receive no more than $5 million. Recipient must be able to demonstrate availability of 50 percent local match. Virginia Clean Water Revolving Loan Fund can be used for local match.	**Overview:** The purpose of the SLAF is to provide matching grants to local governments for the planning, design, and implementation of stormwater best management practices that address cost efficiency and commitments related to reducing water quality pollutant loads. Eligible stormwater projects include: i) new stormwater best management practices; ii) stormwater best management practice retrofits; iii) stream restoration; iv) low impact development projects; v) buffer restorations; vi) pond retrofits, and vii) wetlands restoration. **Verdict:** This is perhaps the best of the grant funds available to help with this project. Granted that Falls Church provides 50 percent of the funding needed for the project (which can even be provided in a loan from the Virginia Clean Water Revolving Loan Fund), SLAF can provide upwards of $5 million in supplemental financial assistance. SLAF has provided funds to numerous stream restoration projects in Virginia. In FY 2015, Falls Church received nearly $120K from SLAF for a series of projects, though none of these dealt with stream restoration.	**Lynchburg:** Burton Creek Stream Restoration **Fairfax County:** Stream Restoration of Tributary to Accotink Creek **Richmond:** Rattlesnake Creek Stream Restoration
Virginia Program *Restoration projects and environmental education* Virginia Environmental Endowment (VEE) info@vee.org (804)644-5000	**$250 - $40K (FY 2015)** Ranges from as little as a couple hundred dollars to tens of thousands of dollars (in FY 2015, ranged from $250 to $40K; total of 35 grants that amounted to over $500K during this period). Projects are required to have matching funds in amounts equal to or in excess of the grant request, and in some cases contributions have reached hundreds of thousands of dollars. Since 1977, grants combined with matching funds have totaled over $75 million.	**Overview:** Among its priorities, this program seeks to improve local rivers and protect water quality throughout Virginia, including restoring and protecting riparian buffers and headwater streams. This entails focusing on tangible improvements to water quality, pollution reduction, and pollution prevention. Preference is given to projects and policies that address local and regional stormwater infrastructure needs and achieve on-the-ground improvements that contribute to healthy watersheds. The program does not provide funds for land purchases. **Verdict:** Through the initial funds provided by VEE can be modest, total funds can extend to hundreds of thousands of dollars as additional partners join and contribute money. Using this grant would require substantial outreach and coordination among community partners, but these efforts could capture large amounts of funds and help boost overall community participation.	**Annandale:** Bull Run Headwaters Initiative **Arlington:** Upper James Home Rivers Initiative **Charlottesville:** Enhanced Water Quality Monitoring & Public Education
Virginia Aquatic Resources Trust Fund (VARTF) *Restoration projects* U.S Army Corps of Engineers and The Nature Conservancy (TNC) POC: Karen Johnson (TNC) karen_johnson@tnc.org (804)644-5800 ext. 116	**$25K - $800K (FY 2014)** Ranges from tens of thousands to hundreds of thousands of dollars (for 2014, projects ranged from $25K to nearly $800K). Depends on availability of eligible money from credits purchased by developers. Between 1995 and 2014, over $48 million in funding provided for 124 projects.	**Overview:** An in-lieu-fee mitigation program whereby developers purchase credits to offset the environmental impacts of their projects. The money collected for these credits funds environmental projects in the impacted areas. The areas authorized for compensatory mitigation include the watersheds of the Potomac River and the Chesapeake Bay, among others. **Verdict:** Suitable for the proposed project, but the TNC POC noted that funds for the area are currently tied up in other projects. She recommended periodically checking back with the TNC (every six months or so) and reviewing the VARTF's annual report (on its website) to gauge the program's priorities.	**Charlottesville:** Meadow Creek **Southeastern VA:** Northwest River **Fauquier County:** Goose Creek

Name	Fund Amounts	Details	Example Projects
Chesapeake Bay Restoration Fund *Restoration projects and environmental education* Virginia Department of Conservation and Recreation and Virginia Division of Legislative Services (DLS) POC: Martin Farber (DLS) mfarber@dls.virginia.gov (804)786-3591 ext. 230	**$250 - $15K** Ranges from a few hundred dollars to upwards of $15,000; average grant amount is $5,000. Since its inception in 1996, more than 1,000 grants totaling $7 million have been awarded.	**Overview:** Supported by revenues from the purchase of Chesapeake Bay commemorative license plate, it provides grants for environmental education and restoration projects to the Chesapeake Bay and its tributaries. Projects must have an educational nexus and be for efforts that the requesting entities would not normally fund on their own. **Verdict:** This program could be applicable, but the project would need to entail some sort of environmental education for the local community (e.g., schoolchildren). Additionally, it can't be used to cover aspects that the city would normally finance on its own. Potential elements of the project, such as water quality monitoring equipment and impervious surfaces, could be considered outside of a jurisdiction's normal expenses and be covered.	**Richmond:** Virginia Save our Streams Program **Woodbridge:** Friends of the Occoquan **Farmville:** Clean Virginia Waterways
5 Star Restoration Program *Restoration projects and environmental education* U.S. EPA POC: Myra Price price.myra@epa.gov (202)566-1225	**$5K - $40K** Ranges from $5K to $4K ($10K average.)The program strives for additional contributions from community partners, with a minimum ratio of 1:1 and most competitive applications at 2:1 or higher. Some projects net hundreds of thousands of dollars from donor contributions.	**Overview:** Brings together students, conservation corps, citizen groups, corporations, landowners, and government agencies to provide environmental education and training through projects that restore wetlands and streams. It provides challenge grants, technical support, and information exchanges to enable community-based restoration projects. **Verdict:** Though the initial funds provided by the EPA are modest, total funds can extend to hundreds of thousands of dollars as additional partners join and contribute money. Using this grant would require substantial outreach and coordination among community partners, but these efforts could capture large amounts of funds and help boost overall community participation.	**Virginia Examples:** **Fairfax County:** Daniels Run Riparian and Wetland Education Project **Blacksburg:** Toms Creek Riparian Corridor Restoration **Annandale:** Restoration of Holmes Run and Reforestation of Luria Park **Stream Restoration Examples:** **San Diego, CA:** Urban Stream Restoration **Escambia County, FL:** Jones Creek East Stream Restoration Project **Covington, LA:** Mile Branch Stream Restoration
Transportation Alternatives Program *Stormwater management, to include stream channel stabilization* Virginia Department of Transportation POC: Pam Liston pamela.liston@vdot.virginia.gov (804)786-2734	**< $1 Million** The amount of funds requested on a project should not exceed $1 million per application cycle. Up to a maximum 80 percent of the eligible project costs can be reimbursed with federal funds. A minimum 20 percent match must come from other public or private sources. Match can be provided for in cash, land value, donated materials and services, and volunteer labor.	**Overview:** The program focuses on community improvements and mitigating the negative impacts of the highway system, among other objectives. To this end, one of the ten qualifying activities includes environmental mitigation to decrease the negative impacts of roads on the natural environment due to highway run-off and water pollution. Elements of this activity can include: stormwater management activities related to highway run-off that address water pollution and improve the ecological balance of local streams and rivers; detention and sediment basins; stream channel stabilization; and storm drain stenciling and river/stream clean-ups. **Verdict:** There are few, if any, stream restoration projects that have been funded by this program in Virginia (most are dedicated to features like trails and sidewalks). Still, such projects have been funded by this program in other states (this is a federal program administered by individual states). Furthermore, the 80 to 20 matching ratio makes this an appealing program.	**Montgomery, MD:** Rock Creek Watershed Restoration **South Burlington, VT:** Bartlett Brook Stormwater Treatment System **Frederick, MD:** Carroll Creek Restoration

Name	Fund Amounts	Details	Example Projects
Land and Water Conservation Fund *Land acquisition* Virginia Department of [illegible] POC: Synthia Waymack synthia.waymack@dcr.virginia.gov (804)786-4379	**$300K - $500K** The maximum grant award request amount is $500K (minimum total project cost $1 million), and the minimum request amount is $300K (minimum total project cost $600K). It is a 50-50 percent matching reimbursement program. The recipient must be able to fund 100 percent of the project while seeking periodic reimbursements. Since its inception in 1965, it has provided $76 million for more than 400 projects.	**Overview:** Established in 1965 as a federal reimbursement program for the acquisition and/or development of public outdoor recreation areas. A key feature of the program is that all LWCF assisted areas must be maintained and opened, in perpetuity, as public outdoor recreation areas. **Verdict:** This program cannot fund stream restoration, only activities associated with acquiring lands for a park and/or developing recreational facilities (including "passive recreation" facilities, such as walking/biking trails and landscaping) within a park. Therefore, for areas that might be acquired and turned into park spaces and for constructing recreational features on these areas, the program could provide support for the project. For the purposes of the grant application, ideally the need to acquire park spaces and to develop those park spaces with recreational features should be identified in official city documents, such as in the comprehensive plan and small areas plans (for one, the N. Washington Street SAP does speak to the need for more open space and amenities like bike routes).	**Fairfax Station:** Fountainhead Regional Park **Clifton:** Braddock Park
Virginia Land Conservation Foundation (VLCF) *Land acquisition (including easements)* Virginia Department of Conservation and Recreation POC: Sarah Richardson sarah.richardson@dcr.virginia.gov (804)225-2048	**$50K - >$300K (FY2015)** Ranges from tens of thousands to hundreds of thousands of dollars (in FY 2015, ranged from $50K to over $300K; total of 14 grants amounted to $2.5 million). Requires a minimum of a 50 percent match, and many grant awardees exceed this. Since 2000, total funds appropriated to VLCF exceeded $49.5 million, and $34.8 million provided in matching grants.	**Overview:** Funds from the VLCF are used to establish permanent conservation easements and to purchase open spaces and parklands, lands of historic or cultural significance, farmlands and forests, and natural areas. State agencies, local governments, public bodies, and registered (tax-exempt) nonprofit groups are eligible. **Verdict:** The program could help to support acquisition of or land easements for open spaces and parklands and/or natural areas, should the project include these elements. Initial VLCF fund amounts can be substantial, though they would need to be matched by other contributors.	**Fluvanna County:** Seven Islands Easement **Chesterfield County:** James River Conservation Area **Loudon County:** Springdale Regional Park Acquisition
Chesapeake Bay Stewardship Fund *Restoration projects (specifically water quality)* National Fish and Wildlife Foundation POC: Jake Reilly jake.reilly@nfwf.org (202)857-0166	**$20K - $200K** Grantees must have matching contributions equal to at least 25 percent of total project costs.	**Overview:** The purpose of this fund is to support community-based projects that protect and restore natural resources within the Chesapeake Bay. Recently awarded river and watershed restoration projects look to improve water quality and habitat restoration. Additionally, the fund supports projects that use innovative methods and expand the effectiveness of restoration. **Verdict:** This grant could help support the restoration of Four Mile Run. A great emphasis should be made on the restoration and protection of the stream's water quality.	**Eastern VA:** Headwaters of Potomac and Shenandoah rivers **Hampton**
U.S. Standard Grants Program *Restoration projects* U.S. Fish and Wildlife Service POC: Stacy Sanchez stacy_sanchez@fws.gov (703)358-2017	**Varied, most around $1M** Initial fund amounts range, but a review of recent projects shows most around $1 million. Matching funds must be at no less than a 1:1 ratio, and they oftentimes greatly exceed this. From 1990 to 2015, 1025 projects received $859.4 million in grants with $2.2 billion in matching funds.	**Overview:** A matching grants program that supports public-private partnerships for projects that further the goals of the North American Wetlands Conservation Act (NAWCA). These projects involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats for the benefit of all wetlands-associated migratory birds. **Verdict:** Given the requirement that projects benefit wetlands-associated migratory birds, this program likely isn't applicable for the proposed project (unless aspects regarding benefiting migratory birds can be added to the project).	**Eastern VA:** Dragon Run **Eastern VA:** Rappahannock River **Southern VA:** Roanoke River